PROTECTIVE IRRIGATION WORKS,

RAJPUTANA.

REPORT

ON THE

WATER SUPPLY FOR PARTABGARH TOWN

IN THE

PARTABGARH STATE.

1905.

AJMER:
SCOTTISH MISSION INDUSTRIES CO., LTD.
1905

INDEX.

Para.		Page
1.	Project described	1
2.	Catchment Area and Water available for Storage...	1
3.	Maximum Discharge and Length of Weir and Weir Level	1
4.	Water-spread and capacity	2
5.	Weir	2
6.	Dam	3
7.	Sluice	3
8.	Weirs below the Dam	3
9.	Weir No. 1	3
10.	Weir No. 2	3
11.	Abstract Estimate of Cost...	4
12.	No Revenue anticipated	4
13.	Preparation of Project	4
14-18.	Specification	4

PLANS.

I.—Index Map and Contour Plan.

II.—Plan Longitudinal Section, Cross Sections of Dam and Sluice.

III.—Longitudinal Sections and Cross Sections of Weirs Nos. 1 and 2.

PARTABGARH STATE.

WATER SUPPLY OF PARTABGARH TOWN.

Reference—Para. 20 of Report on Irrigation in the Partabgarh State.

REPORT.

Project Described.

His Highness the Maharawat is anxious to improve the water supply of Partabgarh and suggested the construction of a Storage Reservoir at a site outside and above the town, near the Rajah's Bungalow.

This site was inspected by the Consulting Engineer for Irrigation in Rajputana in November 1904, and approved by him; and surveys were made, and this Estimate with its accompanying Plans have been prepared for carrying out the Project.

The Dam will start on the right bank of the nullah, from the stables of the Bungalow, across the rocky crossing to the high ground on the left.

Below the storage reservoir thus formed it is proposed to construct two masonry Weirs on the nullah at suitable sites (see Plan No. 1) to hold up the surplus water, as all will be of value for the city.

Catchment Area and Water available for Storage.

2. The catchment area of the proposed Storage Reservoir is $5\frac{1}{4}$ square miles, and we may calculate on 10 per cent. of the average rainfall of 34 inches as available for storage, or 41·65 m. c. ft.

Maximum Discharge and Length of Weir and Weir Level.

3. The weir level and flood level is however fixed by the plinth level of the stables, *viz.*, R.L. 119·93, assuming R.L. 100 to be the bed level of the nullah at the site of dam.

The maximum discharge from the $5\frac{1}{4}$ square miles of catchment area, by Dicken's Formula, is 2855 cusecs; and the length of weir required to discharge this with a 2-ft. head is 286 ft.

The crest of Dam will therefore be R.L. 120 (plinth level of stable), and weir level 5 ft. below this, or R.L. 115.

Water-spread and Capacity.

4. The following is the water-spread and capacity of the proposed Tank at different contours :—

R. L.	Water-spread in s. ft.	Capacity in m. c. ft.
125	5,440,000	22·17
120	3,430,000	12·92
115	1,740,000	6·75
110	960,000	2·95
105	220,000	·36
100		
100		
(Bed level)	Total ...	45·15

With weir level R. L. 115, the tank will have a capacity of 10·06 m. c. ft., but by providing shutters, 1½ ft. in depth as proposed (see next para.), the capacity can be increased to 12·67 m. c ft.

Weir.

5. The Weir will have a clear width of 285 r.ft. and be built across the nullah itself; there is good sound rock in the nullah bed, and the overflow water falling on this will do no harm to the foundations; and a portion of this water will be caught lower down the nullah by the Weirs below.

The Weir will be of stone masonry in lime, 3 ft. thick at top, with a front batter of 1 in 12 and the thickness at any point is fixed by the formula $T = \frac{d}{\sqrt{g}}$, where d is the depth below flood level, and g the specific gravity of masonry, taken as 2·24. The foundations will be countersunk not less than 1 ft. into the solid rock.

Sixty-two cut stone Piers 1½ ft. broad, 1½ ft. deep, and 3 ft. apart are provided on the crest of the Weir, with grooves into which planks can be placed (see Plan No. 2) to hold up another 1½ ft of water after the heavy flood has passed over the weir, to increase the capacity of the tank.

Wing-walls are provided at either end of the weir to protect the earthwork in rear of the dam.

The waterway required to discharge the maximum flood with a 2 ft. head is $\overset{L}{286} \times \overset{D}{2} = 572$ s.ft.

With the arrangement proposed the flood water will rise 2½ ft. above the crest of Weir, *viz* :—

	L.	H.	S.ft.
Waterway available between Piers =	192	× 1½	= 288
„ above Piers	285	× 1	= 285
			s.ft. 573

Flood level will therefore be R. L. 117·5.

6. The Dam will be 820 ft. long, excluding the weir. It will consist of a masonry face wall, backed with earth. The top of the face wall will be at R. L. 118 or 6 inches above flood level, and will be 2 ft. in thickness. The wall will have a front batter of 1 in 12, and the thickness at any point will be $\frac{H}{3}$, where H is the height. Dam.

The foundations will be taken down to and countersunk into the rock. The earth behind the face wall will have a front slope of 3 to 1 up to R. L. 120, the crest of dam ; a top width of 7 ft. and rear slope of 2 to 1. The toe of the rear slope will be pitched for 3 ft. vertical height with a layer of dry stone 1 ft. in thickness on 6 inches of chips, to prevent any possibility of its being cut away by the water held up by the weir below (see Plan No. 2).

7. A Sluice is provided at the south end of the weir, on the left bank of the nullah, so that water can be let down to the weirs below as required. Sluice.

This consists of a circular masonry sluice chamber with a 1-ft. diameter sluice, for the control of the inlet of water, which then passes out by the sluice pipe under the weir into the nullah below.

8. Two Weirs are proposed below the dam as shown on Plan No. 1 to hold up a portion of the excess flood water. Weirs below the Dam.

At the sites selected the nullah has a good rocky bed, with rocky slopes on either side, so that the flood water will not cut away the banks.

9. It is proposed to constructed Weir No. 1 at a point 2000 ft. below the dam, where the level of the nullah bed is R. L. 90·17. Weir No. 1.

The crest will be R. L. 97, so that nearly 7 ft. of water will be held up in the nullah itself at the Weir; and about·95 m.c.ft. of water will be stored.

The Weir will be 320 ft. long, $2\frac{1}{2}$ ft. thick at top, a front batter of 1 in 12 and rear batter of 1 in 4. A tributary nullah joins the main nullah just above the site of this Weir, so that it will have to discharge the maximum flood of $6\frac{1}{4}$ square miles of catchment area, or 3259 cusecs ; and with its length of 320 ft. will pass this with a 2-ft. head, so that flood level will be R. L. 99 ; or when the nullah is in flood the water will spread back to 1 ft. below the toe of rear slope of the Dam above.

10. Weir No. 2 is 1800 ft. lower down the nullah, where the bed level is R. L. 83·62. Weir No. 2.

Its crest will be R. L. 90, or $6\frac{3}{4}$ ft. depth of water will be held up in the nullah, and approximately 1·04 m.c.ft. stored.

The catchment area at this point is 7 square miles and the maximum discharge from this 3,550 cusecs. The Weir has a length of 495 r.ft. and will discharge this with a $1\frac{3}{4}$-ft. head.

Flood level will therefore be R. L. 91·75 and the water stored will be held back up to Weir No. 1, and in flood will form a water cushion for the discharge from that Weir.

Abstract Estimate of Cost.

11. The Abstract Estimate of Cost of carrying out the Project is :—

(*a*) Storage Reservoir—

	Rs.
Dam	8,209
Weir with wing-walls	7,985
Sluice	646
Contingencies	842
(*b*) Weir No. 1	911
(*c*) Weir No. 2	1,503
Total	20,096

No Revenue anticipated.

12. No revenue is anticipated as the work will be carried out simply to increase the water supply of Partabgarh Town; and it should prove a great boon to the inhabitants.

Preparation of Project.

13. The Survey, Plans and Estimate have been prepared by Sub-overseer Luxmi Narain, under the orders and directions of the Superintending Engineer, Protective Irrigation Works, Rajputana.

SPECIFICATION.

Dimensions.

14. All the dimensions of the Dam and Weirs are given in the Plans and Estimate, which are to be strictly adhered to.

Marking out.

15. The centre line and side slopes to be marked by a trench where in earth, and by paint on rock, showing permanently the centre line and inner and outer slopes

Masonry.

16. The foundations for the Weirs and Face Wall to be cut out of the rock, and the masonry counter-sunk into the rock not less than 1 ft.

The masonry to be of rubble stone set in lime mortar; only hard and durable stone to be used, and the masonry to be kept wet during construction. All the stones to be hammer-dressed and to break joint in the same as well as in the successive courses.

All stones to be laid on their natural beds; where there is batter the beds of the stones are to be at right angles to the batter. Hollows between the larger stones to be filled in with smaller ones completely embedded in mortar. No empty hollow to be left, nor spaces filled wholly with mortar or rubbish where pieces of stone ought to have been inserted.

The faces of the masonry in contact with the earth to be left quite rough, and those remaining exposed to be smoothed and pointed with lime mortar.

17. The lime to be of good hard kunkar burnt in wood fuel; cow-dung to be only used for igniting the fire and never to exceed more than 1 per cent. **Lime Mortar.**

The mortar to consist of 1 part of lime to $1\frac{1}{2}$ parts clear sand or surkhee.

18. All the old surface to be picked up for at least 9 inches before any new earth is spread, and all roots and grass removed. **Earth-work.**

The embankment to be carried out in layers not exceeding 9 inches in thickness, carefully consolidated. All the layers to be laid concave, that is lower in the centre. No clods of earth to be on any account allowed, and no earth to be excavated within 100 ft. of the toe of bank.

F. ST.-G. MANNERS SMITH,
SUPERINTENDING ENGINEER,
Protective Irrigation Works, Rajputana.

AJMER:
Dated 23rd May 1905.

ABSTRACT ESTIMATE OF COST.

Water Supply of Partabgarh Town.

Quantity or Number.	Items.	Rate.			Per	Amount.	Total.
	(*a*) STORAGE RESERVOIR.						
	(1) Dam.						
12,697 c.ft.	Excavation, including rock-cutting	3	0	0	100	381	
40,229 „	Masonry	16	0	0	100	6,437	
278,140 „	Earthwork	5	0	0	1,000	1,391	
							8,209
	(2) Weir and Wing-Walls.						
10,915 c.ft.	Rock-cutting	4	0	0	100	437	
43,689 „	Masonry	16	0	0	100	6,990	
418 „	Cut Stone Piers	1	0	0	c. ft.	418	
46·5 „	Wooden Shutters	3	0	0	„	140	
							7,985
	(3) Sluice.						
509 c.ft.	Rock-cutting	4	0	0	100	20	
1,423 „	Masonry	16	0	0	100	228	
1 No.	Sluice 1 ft. diameter	300	0	0	each	300	
34 s ft.	Iron Grating	1	0	0	s. ft.	34	
59 r.ft.	Iron Ladder	0	4	0	r. ft.	15	
14 „	Iron Rails	1	0	0	„	14	
11·5 c.ft.	Woodwork	3	0	0	c. ft.	35	
						646	
	Contingencies	5	0	0	100	842	
							1,488
	(*b*)—WEIR No. 1.						
1,541 c.ft.	Rock-cutting	4	0	0	100	62	
5,042 „	Masonry	16	0	0	100	806	
						868	
	Contingencies	5	0	0	100	43	
							911
	(*c*)—WEIR No. 2.						
1,837 c ft.	Rock cutting	4	0	0	100	74	
8,479 „	Masonry	16	0	0	100	357	
						1431	
	Contingencies	5	0	0	100	72	
							1,503
	Grand Total	...	...	...	...	...	20,096